

In the Claims

The following is a marked-up version of the claims with the language that is underlined (“ ”) being added and the language that contains strikethrough (“~~—~~”) being deleted:

1-35. (Cancelled).

36. (New) A data storage device, comprising:

an electron emitter, the electron emitter including a substrate and a semiconductor layer provided on the substrate, the semiconductor layer comprising a planar outer surface that includes a planar emission surface, wherein the electron emitter is configured to emit electrons from the planar emission surface.

37. (New) The storage device of claim 36, wherein the substrate comprises an n⁺⁺ semiconductor substrate.

38. (New) The storage device of claim 36, wherein the substrate includes a funnel-like active region that is surrounded by an isolation region.

39. (New) The storage device of claim 38, wherein the funnel-like active region comprises a neck that is aligned with the planar emission surface.

40. (New) The storage device of claim 36, wherein the semiconductor layer is made of polysilicon or silicon carbide.

41. (New) The storage device of claim 36, wherein the semiconductor layer comprises a porous region that is aligned with the planar emission surface.

42. (New) The storage device of claim 36, wherein the planar emission surface occupies an area that comprises a small fraction of the total area of the semiconductor layer planar outer surface.

43. (New) The storage device of claim 36, wherein the planar emission surface occupies an area that represents approximately less than 10% of the total area of the semiconductor layer planar outer surface.

44. (New) The storage device of claim 36, wherein the electron emitter further includes a conductive layer formed on the planar emission surface.

45. (New) The storage device of claim 36, wherein the electron emitter further includes a focusing structure that focuses electron beams emitted from the planar emission surface.

46. (New) The storage device of claim 45, wherein the focusing structure comprises an insulating layer, a lens electrode, and a conductive layer.

47. (New) The storage device of claim 36, wherein the electron emitter further includes an insulating layer provided on the semiconductor layer.

48. (New) The storage device of claim 47, wherein the electron emitter further includes a patterning mask provided on the insulating layer.

49. (New) A data storage device for use in a data storage device, comprising:
an electron emitter, the electron emitter including a substrate and an insulator layer provided on the substrate, the insulator layer comprising a planar outer surface that includes a planar emission surface, wherein the electron emitter is configured to emit electrons from the planar emission surface.

50. (New) The storage device of claim 49, wherein the substrate includes a funnel-like active region that is surrounded by an isolation region.

51. (New) The storage device of claim 50, wherein the funnel-like active region comprises a neck that is aligned with the planar emission surface.

52. (New) The storage device of claim 49, wherein the semiconductor layer comprises a thin metal layer that forms part of a metal-insulator-metal (MIM) arrangement and that is aligned with the planar emission surface.

53. (New) The storage device of claim 49, wherein the substrate is made of silicon and forms part of a metal-insulator-silicon (MIS) arrangement.

54. (New) The storage device of claim 49, wherein the planar emission surface occupies an area that comprises a small fraction of the total area of the insulator layer planar outer surface.

55. (New) The storage device of claim 49, wherein the planar emission surface occupies an area that represents approximately less than 10% of the total area of the insulator layer planar outer surface.

56. (New) The storage device of claim 49, wherein the electron emitter further includes a conductive layer formed on the planar emission surface.

57. (New) The storage device of claim 49, wherein the electron emitter further includes a focusing structure that focuses electron beams emitted from the electron emitter.

58. (New) An electron emitter for use in a data storage device, the electron emitter comprising:

a substrate; and

a semiconductor layer provided on the substrate, the semiconductor layer comprising a planar outer surface that includes a planar emission surface;

wherein the electron emitter is configured to emit electrons from the planar emission surface within the data storage device.

59. (New) The electron emitter of claim 58, wherein the substrate comprises an n++ semiconductor substrate.

60. (New) The electron emitter of claim 58, wherein the substrate includes a funnel-like active region that is surrounded by an isolation region.

61. (New) The electron emitter of claim 60, wherein the funnel-like active region comprises a neck that is aligned with the planar emission surface.

62. (New) The electron emitter of claim 58, wherein the semiconductor layer is made of polysilicon or silicon carbide.

63. (New) The electron emitter of claim 58, wherein the semiconductor layer comprises a porous region that is aligned with the planar emission surface.

64. (New) The electron emitter of claim 58, wherein the planar emission surface occupies an area that comprises a small fraction of the total area of the semiconductor layer planar outer surface.

65. (New) The electron emitter of claim 58, wherein the planar emission surface occupies an area that represents approximately less than 10% of the total area of the semiconductor layer planar outer surface.

66. (New) The electron emitter of claim 58, wherein the electron emitter further includes a conductive layer formed on the planar emission surface.

67. (New) The electron emitter of claim 58, wherein the electron emitter further includes a focusing structure that focuses electron beams emitted from the planar emission surface.

68. (New) The electron emitter of claim 67, wherein the focusing structure comprises an insulating layer, a lens electrode, and a conductive layer.

69. (New) The electron emitter of claim 58, wherein the electron emitter further includes an insulating layer provided on the semiconductor layer.

70. (New) The electron emitter of claim 69, wherein the electron emitter further includes a patterning mask provided on the insulating layer.

71. (New) An electron emitter for use in a data storage device, the electron emitter comprising:

a substrate; and

an insulator layer provided on the substrate, the insulator layer comprising a planar outer surface that includes a planar emission surface;

wherein the electron emitter is configured to emit electrons from the planar emission surface within the data storage device.

72. (New) The electron emitter of claim 71, wherein the substrate includes a funnel-like active region that is surrounded by an isolation region.

73. (New) The electron emitter of claim 72, wherein the funnel-like active region comprises a neck that is aligned with the planar emission surface.

74. (New) The electron emitter of claim 71, wherein the semiconductor layer comprises a thin metal layer that forms part of a metal-insulator-metal (MIM) arrangement and that is aligned with the planar emission surface.

75. (New) The electron emitter of claim 71, wherein the substrate is made of silicon and forms part of a metal-insulator-silicon (MIS) arrangement.

76. (New) The electron emitter of claim 71, wherein the planar emission surface occupies an area that comprises a small fraction of the total area of the insulator layer planar outer surface.

77. (New) The electron emitter of claim 71, wherein the planar emission surface occupies an area that represents approximately less than 10% of the total area of the insulator layer planar outer surface.

78. (New) The electron emitter of claim 71, further comprising a conductive layer formed on the planar emission surface.

79. (New) The electron emitter of claim 71, further comprising a focusing structure that focuses electron beams emitted from the planar emission surface.